THE ELECTRICAL WORLD

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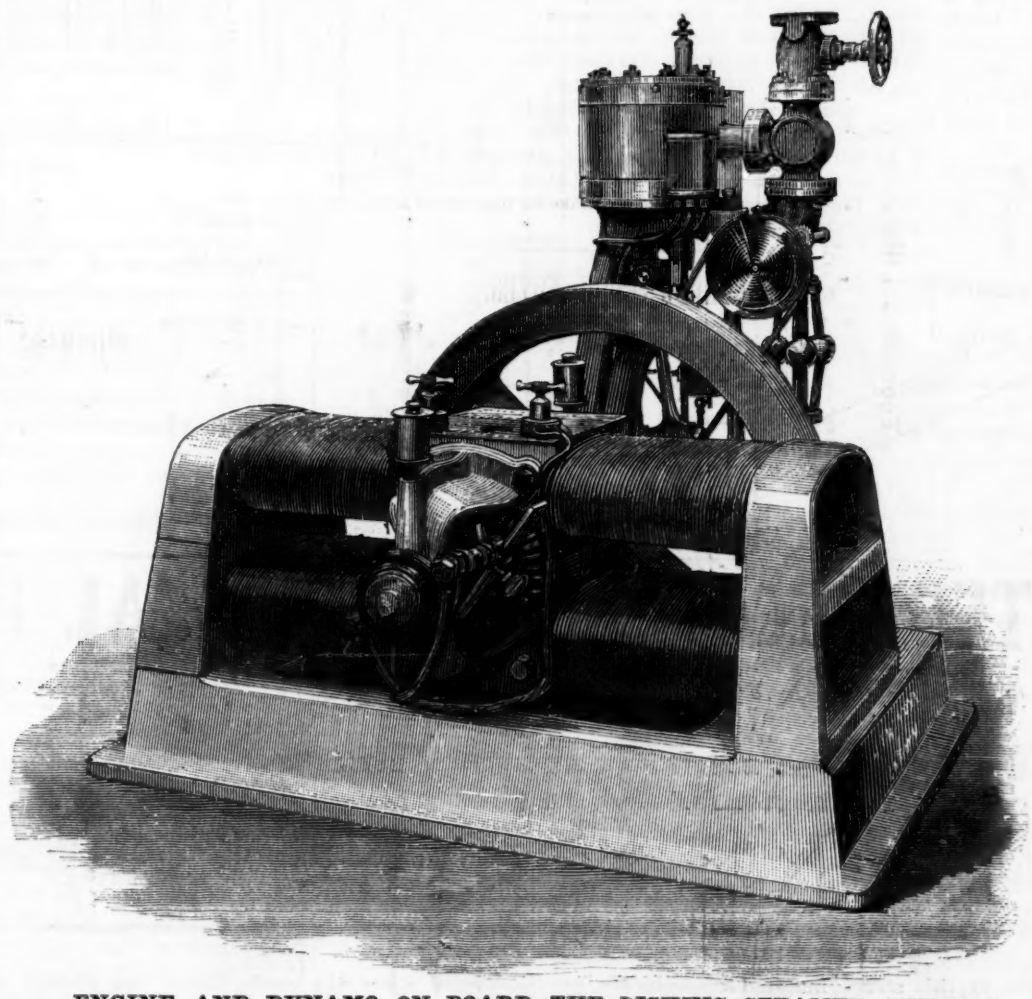
The Electric Light Afloat.

It is evident to all who have followed with interest the progress of the electric light, that it has proved a most brilliant success afloat. At first it may have been that on shipboard gas could not offer so much opposition to the new illuminant as on land, but electricity was not long in showing that it had many superior recommendations for marine service. It gives off no bad smell, provoking nausea in the passenger, and wherever it burns any victim to *mal de mer* can seek "the seclusion that the cabin grants" without wishing himself back on deck exposed to the elements. It does not taint or vitiate the atmosphere, so that through the long nights at sea, when hundreds of persons are cooped up below deck, the air of a steamer provided with electric lights still remains pure. It does not heat the air to any appreciable extent, and hence is peculiarly adapted to use in berths, engine-rooms and cargo holds. And perhaps its greatest merit is that it is about as safe a light to burn afloat as could be hit upon. Gas can hardly be said to be available aboard ship, so that, until recently, candles and oil-lamps were the lights employed at sea. They are a constant menace to the safety of ship, passengers, crew and freight, and it is with a feeling of relief that the owners of valuable vessels have turned their attention to arc and incandescent lamps exclusively.

The palatial ocean steamers that ply across the herring pond will soon, without an exception, employ electricity for lighting. The experiments made only some five years ago on board the City of Berlin, have already borne much fruit. In our issue of June 16, 1883, we gave an illustrated description of the Arizona, with her 600 Swan lamps, and the Normandie with her arc and incandescent outfit. On June 23, 1883, we also illustrated and described the splendid Edison installation of 912 lamps on board the Fall Riv-r boat Pilgrim. Many of our readers no doubt have personally examined the City of Rome with her 500 incandescent lamps, or the Aurania with her round 600, or the Arizona and the Alaska. In the case of the Arizona, the lights have now been running at least eighteen months with perfect satisfaction, while on the City of Rome, Alaska and others the lights are kept up between Liverpool and New York without any interruption. This week there lies at New York one of the latest and finest specimens of marine architecture and electric lighting—the North German Lloyd steamer Ems. Her system includes over 320 incandescent lamps and a masthead arc lamp. In the case of the small lights, Swan lamps and Siemens' machines are employed. The wires are all completely hidden, but they are nevertheless arranged in such a way that they can be easily reached when necessary. For these lamps there is provided a new style of holder, which is at once simple and efficient. Each lamp has its own switch, which is entirely of metal; and it is provided with a lead wire which fuses in the event of the current being too strong. In the case of every set of about 20 lamps there is another switch, so that the lights can be turned on and off in groups as well as individually; and another lead wire, so that the leading wires may be protected from too strong a current. The whole system is such as to preclude the possibility of fire. Duplicate machines are fitted up to guard against any breakdown, and either of them can be started or dropped without interfering with the engine which drives them. The masthead arc lamp, of which Mr. Andrews, of the Woodside Electric Works, Glasgow, is the inventor, is of about 5,000 candle-power concentrated in a single beam of light, that can be moved in any direction forward of the ship. In construction it is extremely simple, consisting merely of a cylinder and piston, the former being a coil of wire. The illuminating power of the lamp is so great that by means of it an object half a mile away can be clearly distinguished by the naked eye on a dark night.

Some time ago it was stated that over sixty English ships used the electric light, and the number must now exceed one hundred. It is computed that there are between 6,000 and 7,000 incandescent lamps afloat, to say nothing of arc. The April bulletin of the Edison Isolated Company shows that from May, 1883, they had fitted up no fewer than fifteen steamers for use in different parts of the country. Messrs. Siemens Brothers have now designed and carried out installations on thirty first-class ocean steamers.

Our remarks above have reference chiefly to the use of the light on board passenger steamers, yachts, etc. But while progress has been great in this particular department, it has been no less marked in others. The adaptability of the electric light to purposes of warfare was speedily seen by the various governments, and at the present time all the Powers of both hemispheres are fitting up their troop ships, ironclads, torpedo boats and other craft, large and small, with the electric light in a multiplicity of applications. Yet another use has been found, as illustrated on this page. Our cut represents the combined "Phœnix" dynamo and "Invincible" high-speed engine, fitted up on board the Clyde-built steamship Tilly, and intended to assist in fishing operations. We copy it, with the details, from the English *Electrical Review*. The lamp and the rest of the electrical apparatus was supplied by Messrs. Paterson & Cooper. The machine is one of their No. 4 series-wound "Phœnix" dynamos. These machines bear an outward resemblance to the Lumley, and one or two other forms in the market, the main distinction being the discarding of all interior projecting pieces in the armature. In some machines these projecting pieces exist for the purpose of dispersing the heat by conduction; in others, for the sake of air spaces to keep the armature cool. The need for this is obviated in the "Phœnix" machine, chiefly by more careful attention to the distribution of the magnetic field. These machines are said to run quite free from sparking. The one here illustrated is run direct from the crank shaft of one of Messrs. J. & H. Gwynne's 5½ in. × 4½ in. cylinder "Invincible" high-speed engines, fitted with "Pickering" governor. The speed is 650 revolutions. The whole is mounted on one bed-plate. The space occupied by the two machines is 3 ft. 9 in. × 3 ft. 9 in. × 3 ft. 10 in. high; steam pressure, 56 lbs. to the square inch.



ENGINE AND DYNAMO ON BOARD THE FISHING STEAMER "TILLY."

This arrangement, with the dynamo compound shunt-wound, is admirably adapted for incandescent lighting on board ship.

The leads from the dynamo to the lamp are very flexible, of specially stranded copper wires incased in India-rubber tubes; they pass round a wooden drum, which takes up the slack. The lowering gear consists of a winch with an iron drum for winding up the chain and lamp. The lamp may be lowered to a depth of 10 fathoms, and gives a powerful and brilliant effect at night. It is of similar mechanism to that made by the firm for workshop and other use, but is altered so as to work with a current to give a light of 15,000 candle-power. The adjustment is effected by means of key and plug hole. A flint glass cylinder of 9½ inches diameter, protected by a wire guard, surrounds the whole lamp.

The idea of using the electric light for fishing purposes is possibly capable of great development before long, it being well known from previous experiments in this direction that a very powerful light has a strangely fascinating effect on the finny tribes, which flock in great numbers toward the light centre, and can then be easily surrounded with a net.

As far as can now be judged, this application will be highly successful and valuable, and though the installation is intended for use in the far-off Javan seas, there is no reason why our American waters and the Newfoundland Banks should not be fished by numerous vessels similarly equipped. We note that the trials made on the Clyde gave excellent results as to the efficiency of the apparatus. The steamer Tilly was anchored off Greenock. the lamp was lowered into the sea, and was then submitted, with engine and dynamo, which stand in the engine-room, to a test of four hours' duration. The sea was illuminated for a considerable distance around the lamp and the steamer. and the effect, as night came on, was most striking.

When the test came to an end at 10 P. M., the lamp was still shining clearly in the depths of the sea, and on being hoisted up it was found to be in perfect order.

It looks as though these special applications of the electric light afloat provide as inviting a field for experiment and investigation as mechanical and electrical ingenuity could wish. As each new steamer is launched and fitted up, some new feature is noticeable in the installation, and no part of the vessel, from keel to masthead and from stem to stern, is left without its special form of electric light. Perhaps the greatest developments of the future will be in the accumulation of electricity during the day, from the main motive power for use during the night, or it may be that in smaller craft light and power will be practically derived from the same source.

Philadelphia and the Exhibition.

II.

Progress of the Great Work.

After describing the origin and growth of the Franklin Institute in our issue of June 7, and before proceeding to a detailed account of many of the interesting things to be seen in Philadelphia, it may be best to present a brief synopsis of the inception and progress of the exhibition.

The project was first started under the auspices of the Franklin Institute, of which we gave a description in our last. It was then given an international character by a circular letter to our representatives abroad, issued by Secretary Folger. The energy displayed by Col. Charles

H. Banes, Dr. William H. Wahl and others soon gave the idea shape, and to-day we have the main building nearly completed.

The exhibition will open on September 2, and continue daily (Sundays excepted) from 10 A. M. to 10 P. M., until October 10. Previous to the formal inauguration, and from August 11 to August 30, the doors will be open for the reception of exhibits.

The site of the buildings is within a few squares of the Market street bridge, on the west bank of the Schuylkill River, and is within easy reach, both by steam and street railways. The main building, of which we have already published two illustrations, is being constructed of wood and glass. It is located on the extensive piece of ground bounded by Thirty-second and Thirty-third streets, Lancaster avenue and Foster street. It will be of shape shown below, with the dimensions, covering a space in all of 67,000 square feet.

Exhibitors can now form an idea as to the positions they are likely to occupy.

A handsome tower not less than sixty feet high

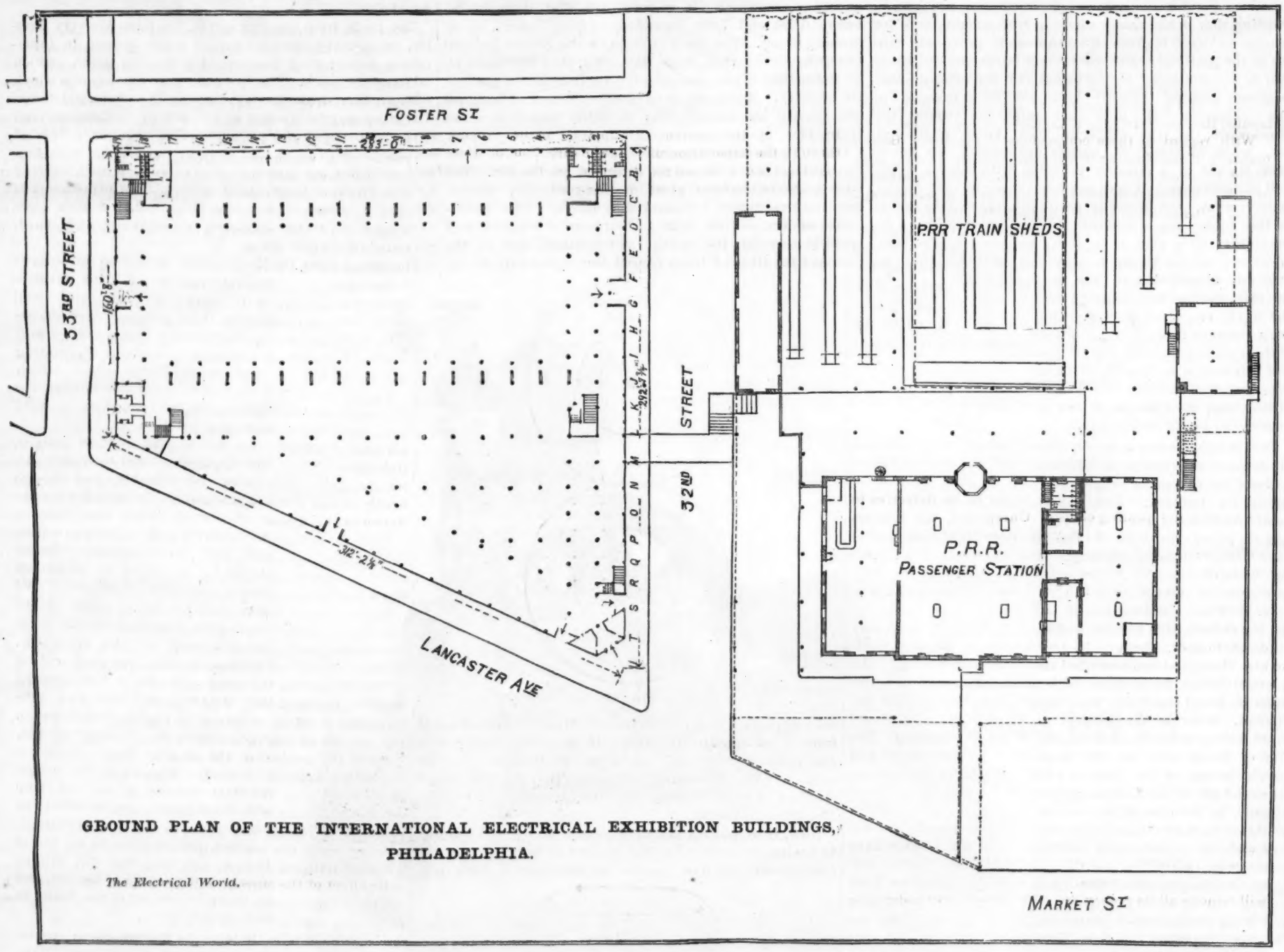
Each exhibitor shall pay an entrance fee of $5, entitling him to one season ticket. Exhibition space must be applied for prior to August 30, and space not occupied by that time may be transferred to others. The charges for space are $2 for all under 10 square feet, aud 20 cents per square foot for all under 100 feet, and thence from $35 for 200 up to $100 for 1,000 square feet. Glass cases are required whenever they can be used, and all articles must be reported to the committee, who will assign them their proper place. Freight and charges must be prepaid and the invoices and bills of lading should be addressed, "Committee on Exhibition, Franklin Institute, Philadelphia." Duplicate cards are to be furnished to exhibitors and agents, and countersigned on receipt thereof—one to be attached to the exhibit and the other to be presented as the order for the delivery thereof at the close of the exhibition.

No exhibit can be removed during the display without the consent of the committee, and all will be at the owner's risk, although a force of day police and night watchmen will be employed. Signs must not exceed five

These powerful lights will be lowered into the water and by lighting up the bed of the river will enable the men-of-war anchored near the exhibition to show how the search for hidden torpedoes is conducted. Interesting contributions are also promised from the Ordinance and Signal Service Departments, and the Lighthouse Board. The latter has promised to show in a comprehensive manner how the beacons on lighthouses are lit by electricity. Through the State Department at Washington application has been made to all foreign Governments for the loan of historical apparatus of interest in the development of electrical science; and to supplement these many of the leading colleges of the United States are expected to exhibit similar apparatus.

The Baltimore & Ohio Telegraph Company will, in accordance with their progressive spirit, have a fine exhibit of telegraphic instrumenss and their method of doing business.

The general public will thus have a chance of learning much that is interesting about electricity and the uses to which it is put. There will also be an electric railway on



GROUND PLAN OF THE INTERNATIONAL ELECTRICAL EXHIBITION BUILDINGS, PHILADELPHIA.

The Electrical World.

will rise from each of the four corners of this structure. A central arch of 100 feet span and 200 feet in length, of the Gothic style of architecture, will cover the greater portion of the space occupied by this building, while two smaller ones, having a width of thirty feet and running parallel to it on either side, will join the towers. The building will have second story apartments at its terminal points on Thirty-second and Thirty-third streeets respectively, with stairways leading up in the towers from the ground floor. Two long corridors will afford means of communication between these rooms. The remainder of the ground will be occupied by a large triangular building one story in height, connected with the main hall. The main entrance to the building will be at the corner of Thirty-second street and Lancaster avenue. There will, however, be another at Thirty-third and Lancaster avenue, and one at each of the towers. Five exits are provided for on the plans, but desirable changes may hereafter be made in number and situation of both entrances and exits before the structure is finished. In addition to these buildings the old Pennsylvania Railroad depot, across the street, has been secured, to be used as an annex. We gave an extended list of the classification of exhibits, and the rules and regulations connected therewith, in our issue of December 22d, last year, but for the benefit of those who may have failed to preserve the paper we present the following summary of those regulations:

hundred square inches, nor be elevated above the goods. Cards, circulars or samples may be distributed from the exhibitor's own stand, but not about the building. The electrician in charge will direct the arrangment of all the conductors.

All articles imported solely for exhibition are to be admitted free of duty, but their subsequent sale or withdrawal from the exhibition for use in this country will necessitate the payment of the regular duties.

Dsecriptive invoices reciting the fact that the goods are intended for the exhibition are required to be made in tripiicate.

Goods may be stored in the exhibition building after it has been duly bonded. The preliminaries completed, the packages will be opened, and their contents appraised and ticketed, a register being kept by an officer of the exhibition in a debit and credit account, the receipts and deliveries being duly checked.

Instruments of precision requiring adaptation or adjustment may be delivered to the Franklin Institute for such purposes, and the president or vice-president will receipt for them.

The interior of the building will be specially adapted to illustrating to advantage the best uses of the incandescent and arc lights under various conditions.

The Board of Engineers of the War Department, at Washington, has given notice that it will give exhibitions of large electric search lights in the Schuylkill River.

shore, an electric launch on the river and a monster dynamo in activity, while workmen will be engaged in manufacturing and rolling out carbons, and giving practical exhibitions of other interesting work peculiar to electricity. In this way it is hoped to make the exhibition popular with all intelligent people, as well as scientific.

It may interest exhibitors at home and abroad to print the following list of railroad and steamship companies which have agreed to return free, over their own lines to the point of shipment, articles which they have carried, intended for the exhibition, upon which freight to Philadelphia shall have been prepaid, and which remain unsold at the close of the exhibition:

Pennsylvania Railroad Company (embracing the Philadelphia, Wilmington and Baltimore Railroad Company, Northern Central Railway Company, West Jersey Railroad Company and Camden and Atlantic Railroad Company).

Philadelphia and Reading Railroad Company.

Lehigh Valley Railroad Company.

American Line Steamship Company, Liverpool—Philadelphia.

Red Star Line Steamship Company, Antwerp—New York—Philadelphia.

Clyde's Coastwise and West India Steam Line, to Charleston, S. C.; Wilmington, N. C.; Richmond and Norfolk, Va. Washington, D. C., and Alexandria; New York, Boston, Providence and Fall River; Havana, Cuba and West India ports.

Ocean Steamship Company of Savannah's line—Savannah—Philadelphia.

Steamship lines—Boston and Philadelphia; Fall River and Philadelphia.

Steamboat (Ericsson line) Company—Baltimore and Philadelphia. J. C.

PHILADELPHIA, June 19, 1884.

Telephonic Privileges in Mexico.

A dispatch of June 11, from the City of Mexico, says: "A new telephone company has just been organized here, called the Republic Telephone, Telegraph and Manufacturing Company. Three concessions, including the use of telephone and district telegraph, besides a special pole concession from the city council, giving the privilege to erect poles throughout the federal district, have been granted to Saturnino Islas, G. L. Wiley and another for the company, and applications have been made for various electrical patents. Mr. Islas is the most prominent electrician in Mexico, and has made some valuable inventions, including a long-distance transmitter, which the company will use. Mr. Wiley was formerly general manager of the Mexican Telephone Company. The new company is identical in interests with the Mexican National Telephone Company, recently organized in New York. The Mexican Telephone Company has applied for a concession for leave to erect poles, but it has not been granted, and, it is said, will not be, without a separate petition for each pole, from which trouble the new company is exempt."

With regard to these concessions Mr. Guiraud, Boston manager of the Mexican Telephone Company, says a later dispatch, shows from the chief official of the department of public works a document to the effect that the permission granted to the Republic Telephone Company was given without prejudice to the rights of third parties; that the new company has no concession, but permission from the department of public works, while the old company has an exclusive privilege for a central exchange system for six years from May, 1882, and that the new company's concession from the city council has not been signed by the governor, who has promised the old company's representative that he will not sign it.

Aerial Wires A Necessity.

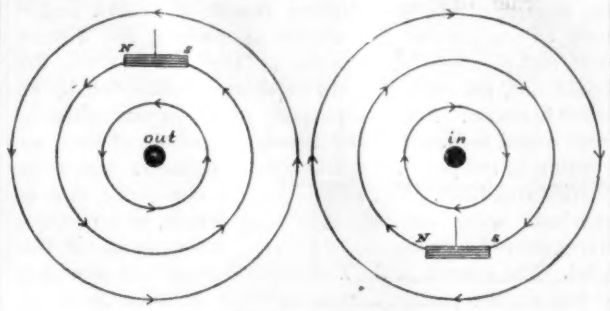
Dr. Norvin Green made the subjoined statement to a reporter this week, in regard to the underground wire law:

I am not a lawyer but the bill seems to be defective in not having a repealing clause. Unrepealed, the statutes giving us power to build telegraph lines are still as good in law as the one just signed compelling us to put the wires underground. No, I cannot say that this company will, or will not, oppose the law. We have not contested it in committee or anywhere else. There are other companies which have greater reasons to oppose it, for we own only 20,000 to 25,000 miles of wires on poles in the city, while the telephone companies have probably 60,000 miles. The Western Union has already placed under ground its trunk lines from the general office south and west, to the exchanges, and on the north the wires are ready to be placed in underground tubes as far as Twenty-third street. We have decided to extend this line to Forty-second street and the Grand Central Depot. Long before the end of the period named in the bill all our trunk lines in this city will probably be underground. It is hardly probable, however, that the city would enforce the law. No penalty for disregarding it has been provided. Paris and London have large underground systems, but in addition perfect networks of overhead wires. I do not think that New York will remove all its pole wires. The people will insist upon having conveniences which they now enjoy. This company, for instance, has 147 branch offices in the city, but if this law should be enforced, more than half of them would be closed at once. Should we run wires under ground to a remote office which now is kept open merely for public convenience? But the effect of the law would be still greater on telephone and district messenger companies. The service would be restricted so that it would be almost useless. In the business parts of the city, where the receipts are large and the distances short, the companies might put their wires underground, but they could not possibly afford to do so in other sections of the city. It would not take long to convince the people of the inconvenience caused by the law. I am quite sure that the opposition companies would suffer much more than we should if the law should be enforced. It would not cost us much more to carry all our trunk lines out of the city under ground, but our opponents would have to begin at the beginning. That reminds me that some persons say that we are not making money. Do you realize that, when we have paid the dividend for this quarter, we shall have paid out since January 1, 1881, exactly $18,000,000 in dividends? In the same three and a half years we have added to the plant $5,700,000, which makes a total of $23,700,000. We have sold in that time $1,000,000 bonds, for which we received about $1,100,000, and a few other things, amounting perhaps to $200,000. All the rest of these payments have been from earnings, for we have no floating debt of any kind. And still there are persons who say we are not earning money. Where do we get it?

How to Construct a Galvanometer.

BY THOMAS R. TALTAVALL—PART V.

In the first part of this article it was shown that if we held a wire parallel to and over or under a magnetic needle and passed a current through it the needle would be deflected from its normal position and would tend to take a position at right angles with the wire. Evidently some force was exerted on the needle to change it from its position of rest to another. This force is electro-magnetism. The passage of a current of electricity through a wire produces a magnetic field, the centre of which is the wire itself, as shown in figures 13 and 14. In figure 13 the current is supposed to be flowing *out* of the paper toward us, and the direction of the arrows represents the direction of the lines of force generated by the current.



FIGS. 13 AND 14.

In Fig. 14 the current is supposed to be flowing *in* through the paper from us. As the direction of the current has been changed the direction of the lines of force will also be changed, as will be observed.

A little study of Figs. 2 (part 1) and 15 will enable us to understand the reason of this reversed action. Fig. 15 is the end view of Fig. 2. The same current that produces the lines of force around the upper portion of the

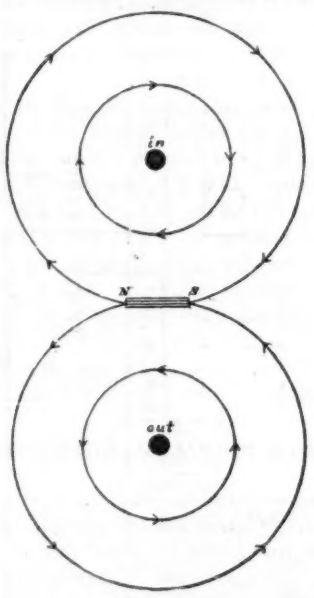


FIG. 15.

wire in passing through the lower portion produces lines of force in the opposite direction. If we straighten the wire out the lines of force will all be in one direction along its entire length. This latter fact proves that the direction of the lines of force depends upon the direction of the current through the wire.

Now, if we place a magnetic needle above and parallel to a wire, as shown in Fig. 1 (part 1), and turn on the current so it will flow *toward* us, the lines of force pro-

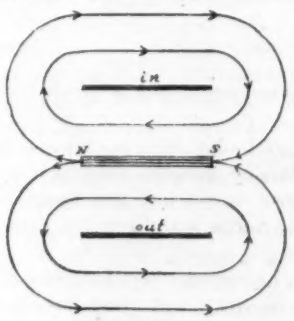


FIG. 16.

duced by the current will deflect the needle at nearly right angles with the wire—with its S pole to the right and its N pole to the left, as shown in Fig. 13.

[In Fig. 13 we would have an end view of the needle, as well as of the wire, were there no current flowing through the latter. Instead, we see the length of the needle on account of its being deflected as explained above.]

If we place the needle below and parallel to the wire and turn on the current so it will flow *from* us, as shown in Fig. 14, the lines of force will be in the reverse direction, but the needle will be deflected in the *same* direction as in the former case—its S pole to the right and its N pole to the left.

Why is the needle deflected when the current is turned on, and why is it deflected in the *same* direction, whether above or below the wire, when the direction of the lines of force in the two cases is opposite?

As has already been said, when a current of electricity passes through a wire, it produces lines of force, or a magnetic field, around the wire. The arrows around the wires in Figs. 13 and 14 represent a portion of this "field." The action on the air of a current in a wire is as though each and every molecule of the air in the immediate neighborhood of the conductor became a magnet and these infinitesimal magnets arranged themselves just as so many steel magnets would—*i. e.*, with their north poles joining the south poles of the preceding ones, and so on right around the circle.

Now, when we place a magnetic needle in this field we may regard it as part and parcel of the system of molecular magnets. It will turn so its north pole will join the south pole of the molecule immediately in front, and thus it becomes part of the line of force, as will be readily understood by reference to Figs, 13 and 14.

The needle itself has its own field, and it is the tendency of the lines of force in this field to combine with those surrounding the wire that causes the needle to deflect. The reason the needle yields to the power of the field around the wire is because it is suspended and easily deflected. If the wire were suspended and the needle held stationary the wire would then be deflected, instead of the needle.

We now understand why an electric current in a wire deflects a magnetic needle, and a little further study of Figs. 13 and 14 will show us why the needle *under* the wire, in Fig. 14, will be deflected in the same direction as the one *above* the wire in Fig. 13, though the direction of the lines of force is opposite. It will be observed that the lines of force around the wire in Fig. 14 flow around in the same direction the hands of a watch move around the face. From what has just been said it is evident that these lines will flow into the south pole of the magnet placed *under* the wire, and flow out at the north pole. In Fig. 13 the direction of the current is reversed, consequently the lines of force will be reversed. Now if we place a needle above the wire, as shown in the figure, it will be deflected so as to allow the lines of force to flow in at the south pole and out at the north pole, and its position wil be the same as it was in the former case.

If we place the needle, in Fig. 13, *under* the wire its north pole would be deflected to the *right* and its south pole to the *left*.

Fig. 15 shows the end view of fig. 2 (in part 1), with the needle suspended at the centre. As will be observed, the lines of force generated around the upper and lower portions of the wire flow in the same direction in the central space. They will coalesce and make a field of double the strength of that around one wire. It is obvious that a needle placed at the centre will be deflected in the manner shown in this figure.

With this exposition of the electro-magnetic action on the needle of a galvanometer well understood we will be prepared to bestow intelligent consideration upon the instrument in its practical form.

In practice we first surround the magnetic needle with a band of copper. We use this form of coil in order to obtain the least possible resistance and at the same time obtain a "field" of uniform density around the needle in whatever position the latter may be in. By reason of the width of the band the "field" produced by a current will be oblong in shape, as shown in Fig. 16. The conditions represented in this figure are in every respect, save in the form of the conductor, the same as those shown in Fig. 15, and we have two "fields," upper and lower. It will be observed that the field between the upper and lower layers of the band is uniform throughout that space. As this space is just as wide as the needle is long, it matters not how much the needle is deflected, its poles will move in a field of uniform density, and thus the maximum magnetic effect of the current will be availed of. This could not be attained under the conditions represented in Fig. 15, for the reason that the more the needle is deflected the less dense will be the field in which its poles will penetrate.

(TO BE CONTINUED.)

WAR ON THE BUCKET SHOPS.—The New York *Herald* says: "The bucket shop must go. The stock exchange was visited on Wednesday by a committee from the Chicago Board of Trade, sent to discuss the best means of closing up the places where errand boys, $10 clerks and impecunious speculators are allowed to buy stocks on margins. The business, it is said, fosters theft from employers, and injures the several exchanges. Strong, but fruitless, efforts to close the shops have been made heretofore by the stock exchange alone, but now it is proposed to secure the cooperation of the produce, the cotton and the petroleum exchanges. The Chicago committee is striving to this end, and the better class of brokers hope the movement will be successful." Bostonians are hoping that the same matter may be agitated at the Hub.

REPORTS FROM THE TROPICS.—General Manager Howard says the Tropical Telephone Company has just received its first remittance from the Barbados exchange, a check for $400, gold, the net profits for May, and the agent writes that he expects to remit regularly hereafter, as the receipts will now exceed expenses and construction by that amount monthly. Reports from Caracas show that the receipts at that point now exceed expenses and construction by $1,200 per month. This property is under control of the Intercontinental company. The unparalleled low price of sugar, and the uncertain state of affairs in the sugar market at Trinidad, have postponed the sale of the plant and business at that place. Believing that the exchange there can be at once made to yield $500 net per month the company may decide to operate it itself.

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WHEN WILL THE WIRES GO UNDER GROUND?

Last Saturday Governor Cleveland signed the bill requiring that telegraph, telephone, electric light and similar wires should be placed under ground in cities of this State of not less than 500,000 inhabitants. The companies owning the wires are to remove them and bury them before November, 1885, under pain of having them removed by the local authorities if the law is not obeyed; and it is provided that the laying of the wires under ground shall not be made a monopoly.

On the face of it, this is a serious piece of legislation for the companies using electric wires, but the companies are all accepting the situation with tolerable equanimity. The remarks of Dr. Norvin Green on the subject, published in another column, express just the sentiments that we find to be entertained by most of the other interested men with whom we have discussed it. Dr. Green contends that the Legislature has no power to compel the Western Union Company to take down poles already put up or the wires strung on them, although it can prevent any extension of aerial systems of wires.

It may, in the long run, be shown that the companies could now put their wires under ground as cheaply as they will ever be able to do so, but unless they all act together the law will remain without effect. No company will proceed single handed with the work, and it would not be allowed now to do so. At present the various parties whom the law affects evince no disposition to move at all in the matter, and we do not see anything that can compel them to move. So far as we learn there is no penalty in the law for disobedience of it. We do not undertake to predict what the twenty-one companies will do during the next sixteen months, but unless they exhibit more alacrity than now appears in freeing the air of wires, New York streets will present at the close of 1885 pretty much the same aspect that they now do, so far as wires are concerned.

An important case decided this week in England is not without bearing on this question of aerial wires. The United Telephone Company put up a private line to connect two places of business in Putney conducted by the same person. The Wandsworth District Board objected. There is no Act of Parliament regulating a transaction of this kind; and the point to be decided was whether the District Board had such a property in a street as to give them the same right of objecting to a wire being stretched across it as a private person would have to object to a wire being stretched across his garden. Mr. Justice Stephen held that for certain purposes the Board have such a property. The case seemed to him to be on all-fours with one in which it was decided that the local authority owned not merely the surface of a street, but so much of the soil underneath it as may be necessary for carrying out alterations or improvements. This decision limits and defines the extent of a street downward; but Mr. Justice Stephen held that it did this upon grounds which applied equally in the opposite direction. The use of a street may be affected by what goes on in the air above as much as by what goes on in the earth beneath; consequently, the authorities in whom the property in the street is vested have the same right to the control and management of the air that they have to the control and management of the ground.

The case was carried up, and it was cabled this week that the Court of Appeals had dissolved the injunction against the telephone company. The court holds that inasmuch as the space to be occupied by the wires is above the area in the ordinary use for street purposes, the street authorities have no right to interfere. This is practically the decision arrived at lately by the Railway Commissioners on an appeal submitted by the same local authorities—the Wandsworth Board. The Post-Office authorities, at the request of the Metropolitan Board of Works, undertook to connect the fire-brigade stations in the district with call-points in each parish, so that whenever a fire broke out, the engines could be at once summoned by an electric alarm. For this purpose about twenty miles of wire would be needed; and nearly the whole of this, according to the plan of the Post-Office engineers, was to be carried overhead. The District Board contended that as overhead wires are necessarily dangerous, underground wires should be used in all future arrangements of this kind. The answer of the Post-Office authorities was that as regards this particular arrangement it must be made in the way they proposed, or not at all. To lay wires under ground would cost about thirty times as much as to carry them overhead; and though the Post-Office was willing to incur the lesser outlay, in consideration of the security against fire it would entail, it was not willing to incur the greater. The Commissioners admitted that overhead wires ought not to be set up except under conditions that will make them harmless to the public. But in the Wandsworth district they thought that these conditions were perfectly attainable. In many sections of the proposed line of wires the streets are little more than country roads, and there was consequently no appreciable risk in carrying wires over them.

We mention these two cases because they crop up at this time, and because what is law in England is sometimes thought to be good enough law for the United States or individual States. It will be observed that the English postal authorities put in the plea of expense. They would only give service with aerial wires, and it is not impossible that the companies here might present the matter in that light, too, at the critical juncture. As it is, the Metropolitan Telephone Company, serving three or four thousand subscribers, have issued orders to close no more contracts for telephone service, except with the understanding that such contracts shall be void if the law is enforced.

EXHIBITION ARRANGEMENTS.

We publish this week the second of our interesting series of letters on Philadelphia and the International Electrical Exhibition. With it we furnish the latest ground plan, supplementary to that which we gave on March 29th. The shell of the exhibition building proper is up, and preparations will very soon begin for the installation of the larger exhibits.

As we promised some time back, the electric light will be conspicuous. The Edison, United States, Brush, Thomson-Houston, Van Depoele, McTighe, Acme, Ball, Imperial and other companies will show their systems at work, with all the accessories utilitarian and æsthetic. The Bell Telephone Company will have an exchange at work, and the telegraph companies will all contribute specimens of their overland or submarine apparatus. The fine arts will be represented in the display of the United States Art Metal Company of New York, and the processes of electroplating will be witnessed daily. The Telemeter Company will exhibit their apparatus for telegraphing the readings of thermometers, barometers and steam gauges, and the New York Electrical Supply Company, Jas. W. Queen & Co., of Philadelphia, and other concerns will show instruments and supplies of every description. Mr. Hilbourn L. Roosevelt, the organ builder, well known to many electricians, has applied for space for his vocalion and organ. The former will be suspended from the roof, and the latter will be placed in one of the galleries, while both will be played from keyboards on the ground floor.

It is hoped that our "kin beyond sea" will send something that can be examined in comparison with American products. We are anxious ourselves to see the largest possible exhibit from abroad, and can safely assure inventors in England, France, Germany and other countries that the Institute will deal with them in the most generous and kindly spirit. It is announced in the excellent *Bulletin* of the exhibition that Vejtruba, of Prague, will show his microphone, agioscope, pinkascope, electric clock and other devices. As our own Government departments contribute, foreign governments may be expected to do so, too, particularly as they control in their respective countries the use of nearly all telegraphic and telephonic appliances.

Special appeals are now being made for the exhibit of historical electrical apparatus and for the memorial library. The committee on the former will relieve the individual exhibitors of all care and expense in attending to the same, and will pay freight charges to and from the exhibition buildings.

The collection of books will, after the exhibition, be placed in the library of the Institute for permanent reference, as a suitable memorial of the state of the science and art at the time of the exhibition. Both features we can recommend most heartily to the consideration of all who have books to contribute and relics to exhibit. Suggestions of any kind will be welcomed by the respective committees.

THE ADVANTAGES OF TELEPHONIC CONNECTION.

An incident is noted in our English exchanges that furnishes striking evidence as to the advantages of telephonic connection. At a large establishment in Manchester the main shaft was broken by torsion a few minutes before closing time one Saturday, so that had a messenger been dispatched to the nearest engineering works he would have arrived too late to see anybody there. The telephone in the office was therefore brought into requisition immediately, and with its aid the manufacturers were able to communicate with a firm of engineers two miles off in time to make preparations for repairing the shaft at once, and on Monday morning everything was ready and running as usual. In this way a day's stoppage of valuable machinery at an important time was avoided, and several hundred workmen were a day's wages in pocket. A very profitable job, however, was lost by a firm of engineers nearer than the firm engaged, but not connected with the telephone exchange.

Instances of this kind are not rare. Only last week we were informed of a like occurrence. A manufacturing firm somewhere in New Jersey telephoned one morning this month to their correspondents in New York that their belting had met with an accident, and that they must have some more immediately. The order was sent out by telephone in New York, the belting was purchased, and it was delivered at the factory in New Jersey before the firm there were ready to put it on. A few hours later the same day they telephoned to New York expressing their thanks and their surprise that the commission could have been executed with such rapidity.

A saucy truckman drove by the toll-taker at the New York end of the Brooklyn Bridge, last Friday, without paying his fare, and was in high glee over the feat. The fine was $10, and he has not yet recovered from his disgust on being informed before the Justice that all the cool toll-taker had done was to telephone quietly across the Bridge, describing him to the police at the other end.

AN INCANDESCENT LAMP REGULATOR.

Heretofore, when it has been desired to diminish temporarily the intensity of light in a system of incandescent electric lamps, such, for instance, as used in a theatre, the result has been obtained by introducing artificial resistance into the circuit, and while this method has been fairly successful in its object it presents features which are not altogether desirable. For example, as is well known, the carbon loses its white color and assumes at once a reddish hue, which it imparts, in a measure, to surrounding objects.

A plan, therefore, which will decrease the volume or intensity of the light without changing its color has long been sought by various investigators, and Col. Thompson, of the Holly Water Works, is at present experimenting with a device which promises to meet the requirements. In this device the carbon is arranged as usual, but in addition, the lower arms of that material are encased in movable sockets of platinum. These sockets are connected at the bottom by an insulated cross-arm, from the centre of which a projecting slender piece of iron runs downward. At the lower end of and attached to this iron is a magnet which is surrounded by a solenoid. The solenoid is so arranged that by means of suitable switches a current may be sent through it in either direction. A current in one direction attracts the magnet; a current in an opposite direction repels it. In either case it carries the sockets with it. The result of this action is that the sockets around the carbon filament may be made to cover a greater or smaller portion of the carbon, as desired, and thus decrease or diminish the incandescent surface and likewise the intensity of the light.

The resistance of the lamp is, of course, reduced by the interposition of the platinum, but means are employed to counteract any detrimental results from this cause, and the current is uniformly kept at the nominal strength. The sockets, solenoid, etc., are all placed within the glass vacuum globe. Of course the operation of the solenoid or solenoids is effected by an independent local circuit.

A PROGRESSIVE LIGHTING COMPANY.

We published recently a summary of the last annual report of the American Electric and Illuminating Company, from which it was clear that the company had succeeded, thanks to their own enterprise and the possession of one of the very best systems of lighting, in building up a large and profitable business in a very short time. It has been the general practice, especially in England, when starting companies for electric lighting, to over-capitalise them, but the above Company have been an exception to the rule, for they have worked on a cash capital of only $250,000. The time has come, however, when the Directorate and the shareholders must prove themselves worthy of their

fortunes by rising to the opportunities that open before them. The new contract with the Thomson-Houston Company cedes to the American Company full control of all the territory east of the Mississippi River, except Illinois, Louisiana, Pennsylvania, Delaware and New Jersey, while in Illinois and Louisiana, as well as in the States west of the Mississippi, the two companies operate conjointly. To exploit this territory requires new capital, and having paid 12 per cent. on their existing stock and business, the directors feel warranted in issuing $100,000 of preferred treasury stock, in $10 shares, at par. As the company have done so well in the past, they may expect to continue prosperous, and with more funds at their command, to develop with even greater returns a rich territory. The era of electric lighting has barely begun, and a system like the Thomson-Houston cannot be hidden under a bushel. It seems to us that a sound investment is offered, one at any rate deserving of inquiry and consideration.

THE TELEGRAPH IN CHINA.

The distaste of the inhabitants of the Celestial Kingdom for railroads and other improvements of the "barbarian" is well known. At first sight it would appear that the Chinese had no wish or intention of joining in the modern march of civilization. But there is an onward movement, slight though it be. A correspondent at Shanghai informs us that the Imperial Chinese Telegraphs are rapidly extending. Probably the government has learned that the telegraph can be made a very efficient agent of administration. Since 1881 a line has extended from Tientsin to Shanghai, crossing the Yangtsekiang at Chinkiangfu, and touching at all the principal cities on the route. The line follows the grand canal all the way. In addition to numerous small branch lines to cities a short distance away from the main line, a branch is now being built along the Yangtsekiang up to Hankow. South of Shanghai, the line reaches as far as Foochow. Another line is being built northward from Canton to connect with the line at Foochow, so that before long there will be a line along the China coast from Tientsin to Canton. The line has been brought down from Canton to the Tonquin frontier for military purposes, as the authorities find it necessary to get early intimation of the operations of the French in that quarter. All the lines have been built by engineers drawn from the staff of the great Northern Telegraph Company.

MAGNETISM IN THE MANUFACTURE OF STRAWBERRY BOXES.

The extensive use of strawberry boxes has created a market for such articles in all strawberry growing centres, and these boxes can now be made so cheaply that in most instances dealers have no desire to ask the return of empty ones.

The business of strawberry box making is almost entirely in the hands of urchins from twelve to fourteen years of age, and skillful workers are able to make about 1,500 per day, or an average of almost three per minute.

The manufacture of these boxes is expedited to no inconsiderable extent by the aid and simple use of a magnetic hammer in the following manner: A wooden inclined plane, on which are placed the tacks to be used, is given a vibrating motion, which causes the tacks to descend the incline slowly. The tacks naturally descend head foremost, and as they do so the boy points the head of his magnetic hammer to a tack, which jumps to meet the hammer. After which it is but the work of a moment to insert the tack in its proper place. These boxes are furnished at less than half a cent each, owing to this ingenious application of magnetism.

THE BRUSH COMPANY'S OFFICERS.

We learn that important changes have been made in the personnel of the parent Brush Company. A meeting of the directors was held at Cleveland, on June 18, for the election of officers and other business. General Leggett declined another term as President, as the other calls on his time are so numerous and exacting. Mr. George W. Stockly was thereupon elected President. He retains the position of General Manager, but resigns that of Treasurer. This vacancy will be filled shortly. Mr. James J. Tracy was elected Vice-President, and Mr. W. F. Swift remains Secretary. Mr. Stockly's abilities have been most creditably shown in his discharge of the duties of General Manager, and there is every reason to believe that as President he will even more remarkably than heretofore advance the best interests of the great corporation of which he has become the head. A better selection for the post could not have been made.

The Lalande-Chaperon Battery.

The subjoined interesting article appears in *L'Electricien*, and, translated, in our English contemporaries, from which we have collated it:

In order to realize practically the various models of the oxide of copper battery, the principle of which we made known in 1881, we were obliged to pursue a rather extensive series of researches, the results of which may be interesting. These researches made during several months, have been lately, for special reasons, conducted chiefly by one of us, to whom is intrusted the determination of the practical conditions for employment and the construction of models of the new battery. M. le Dr. A. d'Arsonval has kindly lent us his valuable assistance in this work.

Our object was to construct a voltaic element of long duration, but the conditions to be fulfilled, in order to obtain such a couple, are in fact very difficult to combine. In the first place, nothing must be consumed except on closed circuit; this eliminates all combinations with two liquids, in which the mixture of the solutions, retarded or not by porous diaphragms, necessitates an unproductive expenditure, which results in a low power (as in the case of the Daniell and the Callaud batteries), or a short duration of action (as in the case of the Bunsen Battery). The combination sought must, therefore, have a solid depolarizer.

The consumable metal must, moreover, not react upon the liquid in which it is immersed when the battery is not working. In examining the series of metals, which are of

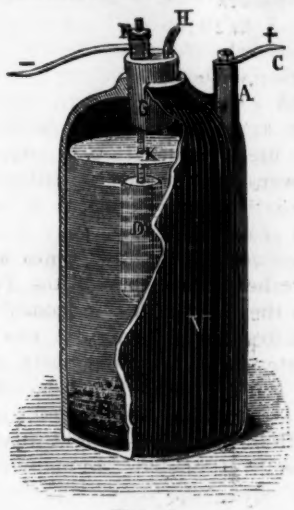


FIG. 1.

sufficiently low price for commercial employment, and that of electrolytes which attack them, we found that very few were suitable. This number is still further diminished if we require a strong chemical action between the metal and the liquid when the circuit is closed. There remained then only zinc in salts of ammonia, or very well amalgamated zinc in acids, which appeared capable of fulfilling these conditions. But the salts of ammonia can only dissolve a very small quantity of zinc before producing insoluble crystals, which cover the metal; and, as for amalgamated zinc, it is very notably dissolved in weak acids, which causes a considerable loss.

Fortunately there is another combination which answers the purpose, this is that of zinc and a concentrated alkaline solution. Described upon various occasions in special treatises, it was again brought before the attention of specialists at the time when we commenced these researches by various publications, among others those relating to the Reynier battery. Caustic potash or soda in solution at 30 or 35 per cent., for example, possesses the remarkable properties of not attacking zinc (or tin, lead, and some other metals), on open circuit, of possessing a very low resistance, and, lastly, of dissolving, when the battery is

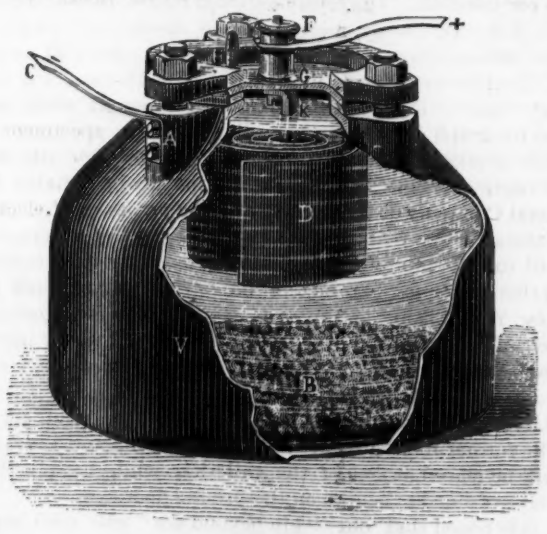


FIG. 2.

in action, considerable quantities of metal without producing any crystallization or any objectionable deposit.

We hoped, therefore, by combining zinc and an alkaline solution with an efficacious solid depolarizer to obtain the conditions of an element capable of action for a very long period, like the Leclanché battery, and furnishing, with small volume, constant currents of considerable intensity—several ampères, for example.

This naturally led us to try, as the depolarizing material, metallic oxides, a large number of which are insoluble in the alkalies. Among all those which we have examined none seemed to furnish electrodes so suitable as oxide of copper.

Having ascertained in a general manner that the combination of the properties of oxide of copper and those of alkaline solutions enabled us to construct a cell which would last and give a high duty, it remained for us to design simple forms for different uses. The use of agglomerate depolarizing solids in these days has been much upheld, and we tried at first to obtain oxide of copper in this form. We have obtained products having energetic depolarizing properties, and offering great resistance to the dissolving action of caustic alkalies. They are prepared by mixing a small quantity of oxychloride of magnesium with oxide of copper, and molding the material on a metal support to insure contact. This method of using the oxide readily permits of the formation of elements of small volume and large surface. It is necessary to remark, however, that under ordinary conditions, when the battery must not be recharged after running down, these agglomerate plates become, as in the Leclanché cell, a useless residue, and the work expended in their manufacture is entirely thrown away. On the other hand, the pure metallic copper obtained by the reduction of the unmixed oxide is far from being valueless. Accordingly it seems to us more practical to apply the oxide to the conducting support, which in this case should be horizontal by its own weight alone. We have already described different models constructed under these conditions in which the depolarizing material rests on a plate, or, better still, at the bottom of a metal jar. This is, in point of fact, the most handy form for numerous purposes. The use of agglomerate plates should be reserved for special cases.

In these cells the zinc is placed in the upper part, and when in work the very dense solution of zincate of potash which is formed falls to the bottom of the jar, where it lies in a sirupy layer, so that to the very end the zinc is in contact with the dilute alkaline liquid which should attack it. This it does under these conditions with perfect regularity, while plates of zinc immersed as far as the bottom of batteries of the same kind are eaten away with increasing rapidity from bottom to top. A plate of zinc 3 millimetres thick, placed horizontally, can be eaten away so regularly as to have at last a uniform thickness of only two to three tenths of a millimetre. In batteries at rest the separation of the solution of potash and the saturated solution of zincate which falls to the bottom may be clear enough to permit of renewing the exciting liquid by siphoning off the saturated parts to replace them. Soda gives apparently the same results as potash, both as regards E. M. F. and internal resistance. We usually employ potash, as we have already pointed out, to avoid the formation of creeping salts. This inconvenience can, however, be avoided in large cells by simply covering the surface with a liquid not attackable by soda. It is useful to employ sufficiently concentrated solutions up to 30 or 40 per cent. for instance. In point of fact a solution containing five or six per cent. of potash dissolves but very little oxide of zinc, and a solution of alkaline zincate precipitates oxide of zinc when diluted with water. There is therefore a far greater relative proportion of unused alkali the more dilute the solution is. When the alkaline solution in the battery is saturated, though the circuit be closed, the zinc continues nevertheless to be attacked; but then oxide of zinc is deposited as much at the bottom of the jar as on the zinc, which it covers with a hard crust. The appearance of these deposits indicates the exhaustion of the battery. The carbonic acid of the air is absorbed by the potash of the batteries, especially if the surface is not protected by a cover or layer of liquid. This absorption, which otherwise is very slow, is only inconvenient so far as it renders useless the quantity of potash converted into the carbonate state. When the alkaline solution is saturated with oxide of zinc and remains exposed long enough to the action of the air, it causes insoluble crystals to be deposited in water which appear to be oxide or hydrate of zinc. One serious inconvenience is found in nearly all batteries intended to remain untouched for a long period; this is that the zinc, even with an open circuit, is rapidly attacked at the level of the liquid and to a small distance below the surface. It may in this way be completely cut in two, even if it be a thick plate, and the working of the cell be stopped. The use of insulating varnish or protecting bands of india rubber gets over this difficulty. If the zinc be suspended by a wire or rod of any other soluble metal, a local couple is formed which rapidly destroys the electrode at the point of attachment. In common with M. D'Arsonval we thought of using a rod or plate of brass or amalgamated copper as a support for the zinc. Amalgamated zinc will not form a couple with amalgamated brass, even after a long period of immersion. This method we have adopted for all batteries required for any length of time. The zinc is always completely immersed and suspended by a conductor of amalgamated brass connected with a terminal.

The oxide of copper battery can be made in many different forms, according to the service it is intended for. Besides the models already described we have designed others with an external iron jar, which offers the advantage of being hermetically closed, readily portable, and of great solidity—very important qualities for cells inclosing a caustic liquid. In one of these forms (Fig. 1) the outer jar, of .09m. diameter, looks like a shell. It constitutes the positive pole; a terminal, *A*, projects as shown. The outside of the jar is paraffined when cold, so as to prevent rust and short circuiting. The zinc *D* is formed of a cylinder .02m. in diameter, soldered to a rod of amalgamated brass, *K*, fitted in an india rubber tube, *G*, and carries the terminal *F*. The tube is also traversed by a metal tube terminated by a plug, *H*, formed of split

india rubber tubing. These cells are usually delivered filled with the potash solution, so that to mount them it is only necessary to throw in the proper quantity of oxide of copper, which spreads over the bottom at *B*, and to close the cell by means of the india rubber stopper carrying the zinc. This arrangement is particularly handy for use in rooms for telephones or electric bells. This type will give a duty amounting to nearly two ampères. A smaller type of .05m. diameter is fully capable of several years' electric bell work.

Fig. 2 shows another type of hermetically closed cell which has more recently been brought into use. It has a large surface, 22m. diameter, and gives a duty of 8 to 10 ampères, which allows of its being used for the same purposes as the Bunsen and bichromate batteries, viz.:—Charging accumulators, lighting houses, electro plating, induction coils, &c. The arrangement of this cell is very similar to that of the foregoing. The oxide of the copper *B* is similarly spread over the bottom of the jar; the zinc *D*, consisting of a long plate rolled in a spiral form, to offer large surface, is suspended from an ebonite cover *G*, fitted on the mouth of the jar by means of screws, as shown, and having an india rubber washer to secure the joint. These large elements have the same charge as our large trough cells, viz., two kilograms of potash and .900 kilogram of oxide of copper, and can be used instead of them for all purposes. They are capable of a considerable amount of work. For instance, a trough battery has kept an Edison 5-candle lamp alight for more than 200 hours. By using six elements we have been able to carry on nickel-plating work during nearly two months at the rate of seven hours per day, which required three Bunsen elements. The latter required to be remounted every two days, and did not give nearly such a constant current, thus causing numerous troubles. These iron batteries have the remarkable property of being able to give without polarization a duty far higher than corresponding non-metallic cells, whose conducting surface in contact with oxide of copper should be as large. As no hydrogen is disengaged at the iron, it seems to us that its large surface must nevertheless be charged with occluded hydrogen, which is carried gradually as far as the oxide of copper, and thus assists the depolarizing action in a continuous manner.

It remains for us to design some practical reversible batteries, having a large and small duty. When an oxide of copper battery is exhausted, and a suitable current is made to traverse it, the oxygen at the positive pole is wholly absorbed by the reduced copper; but if the support of the depolarizing material is of copper, a small quantity of the latter is dissolved, giving a blue color to the liquid. The copper obtained by the reduction of the oxide, however, is not dissolved. We have ascertained that by employing iron or cast iron as a support, this attacking and dissolution of the copper is avoided, provided that the oxide used has been free at the outset from metallic copper. The great difficulty lies in the deposit of zinc. This metal is precipitated in a form which is not sufficiently coherent, particularly when it is required to have moderate thicknesses. We avoid this difficulty either by precipitating the zinc on a very large surface of brass or amalgamated copper, on a mass of copper shavings for instance, or by precipitating it on a horizontal surface of amalgamated brass, covered with an excess of mercury and furnished with depressions for the metal to lodge in. The under part of this support is further covered with an insulator. The zinc can then only arrange itself on the surface, and as it immediately amalgamates, the deposit becomes coherent, and can without loss furnish a fresh amount of current by its dissolution. We hope shortly to describe reversible batteries constructed in accordance with the foregoing data.

The Edison Light in Europe.

Mr. Charles Batchelor, who has been engaged in Europe developing the Edison system there commercially, thus reports progress to a reporter:

"Our factories on the Seine, to which you alluded some time ago, are the only ones of their kind in Europe, and the contracts on hand are more than our 400 employés can carry out at present."

"You have a 20,000 light circuit, I understand, for Paris?"

"We are completing it here—the diagrams, plans, machinery, etc., but the arrangement has already been made. It covers the very heart of the city, the Rue de l'Opera and other points which have heretofore been unsuccessfully attempted to be covered by the best class of arc lights. We have lighted already the Hôtel de Ville, or City Hall. We have over 6,000 lights in the Grand Opera-House, 2,000 in the Eden Theatre, 1,200 in the Comique, 1,200 in the Vaudeville, and 1,200 in the Grand Hotel. I think it a fair estimate to say that our contracts now cover about 26,000 private lights to which we furnish no power, but only the globes, etc. There are 600 lamps in La Nouveauté, 500 in La Varieté, 500 in La Bouffe Parisenne. You will find them in all the cafés from the Madeleine to the Varieté, and as far north as the Gare St. Lazare, and as far south as the Hôtel Continental. Through all this district, the most important in the city, we have the option of the right of way, for all private lighting purposes on the payment of two and one-half million francs, and our rights are guaranteed by the government. Vaucourbiel, director of the Grand Opera, is anxious to have us hurry, as it will save outlay and secure comfort. It will require a company of 3,500,000 francs capital, and there are capitalists willing enough to go in for larger amounts than that. The whole matter will, however, go into the hands of the Compagnie Continental, which will take care of and assume all the patents and pay to the company here 80 per cent. of all the profits above 6 per cent. upon its original capital stock. This company was organized under the Compagnie Continental Edison, which owns all the electric lighting patents for Europe, the Edison Electric Light Company of Europe Limited and Compagnie Electrique Edison. The Compagnie Continental has a paid-up capital of 3,500,000 francs, of which one-half has already been expended in factory and tools, and it is engaged in laying out its work all over Europe. There remain nearly 2,000,000 francs with which to go into a new business, while Paris is willing to contribute another 3,000,000 of francs for its own purposes, thus giving, with offers from other sources, a capital of 6,500,000 francs, of which it is proposed to expend 3,500,000 francs in new works.

"At Ivry-sur-Seine we are making 800 lamps a day and all are sold before they are made. There was, when I left there, on hand an order for 2,500 lights from a German company. Our lamps are in use in the Bank of France, and in such immense dry goods establishments as La Louvre and La Printemps. There is a contract awaiting our signature for 6,000 lamps in the Bon Marché, the company going so far as to offer us room in which to place a station. They will pay for the installation of the first 500 lights, and if they are satisfactory will pay for the whole plant. Mills are being lighted all over France under our patent, they furnishing the power, etc., and we furnishing only the globes and making the adjustments. The Quartier Marbœuf of Paris is not even supplied with gas, and we have been guaranteed 500,000 francs per annum for service without any outlay."

"Then you are only selling your rights?"

"The whole has been arranged under the German company's purchase. They paid $320,000 cash and a royalty on every lamp and on every horse-power. The French company has made a contract with the Germans for 5,000,000 francs for the right to use all the Edison rights. Siemens & Halske, the great German manufacturers, have a sub-contract with the original owners by which they agree to pay a royalty for every incandescent lamp which they make, whether the lamp be of the Edison, Swan or Siemens patterns, since they are used in connection with the Edison system. Siemens is the strongest manufacturer in Germany and, had he been against us, I do not hesitate to say that he could have killed our plans. He said they were the best, and they were adopted. To go back to Paris, we are going to place our central station at the corner of the Rue Coumartin and the Boulevard des Capucines, and very near the Eden Theatre. Next on the line comes the Grand Opera-House, where we have 6,000 lights, and the Place de l'Opera, and all the display of the Boulevard des Italiens. The whole surrounding district is the most brilliant in the city and the one where all our predecessors have made simple displays, while we are establishing a station solely for business.

"We got a good start from the expositions at Munich, Vienna, Paris and Nice. The exhibition at the latter place was, I am sorry to say, a great failure, despite the government backing, but we lighted the buildings independently and on our own account, and it paid us. Our plant is now being negotiated for by the proprietors of Monte Carlo, and will very likely be purchased by them.

"To go as far away as possible, we are arranging to light the Nevski Prospect, in St. Petersburg, the handsomest street in Europe. It seems scarcely credible, but contracts are pending for lighting a district in far away and unusually slow-footed Finland, where people do most of their traveling on sleds, and where there are scarcely 500 miles of railroad. We have contracts for the Hof, or Residence, and Imperial Theatres at Munich, under the special direction of King Louis of Bavaria. Strassburg and Rotterdam are already ours, and the Austrian companies already organized have capitals of 60,000,000 gulden, while a special company is organizing in Berlin. Our patents cover all the countries where patents are granted.

The Thomson-Houston Incandescent Light in Hartford, Conn.

Advices of June 13 from Hartford, Conn., say: The incandescent electric lights of the American system, introduced here by the American Electric and Illuminating Company of Boston, for the local lighting company, have been introduced in the office of the *Daily Courant* and give the utmost satisfaction. The light is clear, steady, and brilliant, and operates admirably on the same circuit with the arc lights. The company is overrun with orders for the incandescent lamps, and will begin supplying them on a large scale within a few weeks. In the meantime the arc-lighting of the streets and public squares is giving so much satisfaction that the city government has voted to increase the number of lights largely, in response to numerous petitions. The board of street commissioners on Monday evening reported as follows upon these lights:

The electric lights now in use, the board are convinced, give entire satisfaction to the public. They far surpass the anticipations of the commissioners, not only in respect to the apparent volume and brilliancy of the light in the lamp, but also in respect to the distance over which its illuminating rays are projected. Gaslights in proximity are hardly more discernible or useful than are the stars in the unclouded blaze of a noonday sun. The board favor the adoption of these lamps in place of gas lamps, wherever the substitution can be made without a material increase in cost. If tenfold the present amount of illumination can be had for the same price the public interest would seem to demand its acceptance.

The Origin of the B. & O.

President Bates conversed with "Gath" recently on the affairs of his company. The following is an interesting part of the conversation:

"How came the B. & O. Company to go into telegraphy?"

"They had a large and extending system of wire, and they suggested to Gen. Butler an amendment to a bill allowing railroads to conduct a telegraph business. Butler passed that amendment on the 23d of June, 1879, nearly five years ago. The next day the Baltimore & Ohio went into the telegraph business. They found that they made money at it, and resolved to build independently to New York. Immediately their business sprang up, so that they looked about for a more general organization. I had become very familiar with the messenger services in the cities, and they bought out the Manhattan Company.

"The Baltimore & Ohio have been a good while in the telegraph business. Why," said Mr. Bates, "this company still have living as their attorney the man who bought from Morse for Amos Kendall and others the first telegraph line in the world. You know the government had a wire stretched from Washington to Baltimore, and it turned out to work well. Thereupon Amos Kendall resigned from the government service and organized a telegraph company. The wire was stretched along the Baltimore & Ohio Railroad line. Mr. Latrobe, who drew up the papers at that time, is the Baltimore & Ohio's counsel now. We are, therefore, the oldest corporation in the telegraph business."

Telegraph Companies in Court.

The legal war between the Western Union and the Baltimore & Ohio Telegraph Companies came to an end—at least for the present—on the 16th inst. The hearing of the several motions for injunctions in the five suits pending between those two companies was begun before Judge Sedgwick, in Superior Court, Chambers. Gen. J. Wager Swayne, Clarence Cary and Mr. Dixon appeared for the Western Union Company, and E. R. Bacon, Grosvenor P. Lowery and C. F. Stone for the Baltimore & Ohio.

After listening to long arguments, and the reading of affidavits pro and con., Judge Sedgwick vacated the three injunctions obtained by the Western Union and the Gold and Stock Telegraph Companies restraining the Baltimore & Ohio from constructing its lines in Second avenue, between Thirty-first and One Hundred and Tenth streets; in Eleventh avenue, between Forty-second and Fifty-first streets, and in William, Beaver and Broad streets. The Court directed that an order should be entered in the suits of the Baltimore & Ohio against the Western Union Company and the Baltimore & Ohio against the Western Union, Metropolitan Telephone & Telegraph, and Gold & Stock Telegraph Companies, insuring to the Baltimore & Ohio Telegraph Company the right to construct, maintain, and operate its lines over the routes and through the streets designated. It was stipulated that the said lines should not be allowed to interfere with the lines of the Western Union Company. The last-named company was authorized to maintain its lines on either a higher or lower level than those of the rival company, in such a manner as not to interfere with the operation of the Baltimore & Ohio lines. The officers of the Baltimore & Ohio will proceed at once with their work of extension.

No Further Consolidation Yet.

Officers of the Baltimore and Ohio Telgraph Company, including President and General Manager D. H. Bates, and officers of the Postal, including General Manager Cummins, said on Tuesday that the published reports of a consolidation or any other union of the two companies were pure fabrications. While representatives of both sides admitted that a union or a territorial or working agreement of some sort was one of the possibilities of the future, and in some respects desirable for both, they said positively that no negotiations on these points had yet been opened, though there has been some informal talk on the subject of territory.

An officer of one of the companies said that he presumed the story arose from what he was told was a fact, that Mr. Robert Garrett of the Baltimore and Ohio, and one of the directors of the Bankers and Merchants' met casually on Monday. Another officer said that he had been informed that a prominent stock brokerage house had made extensive short sales of Western Union and had circulated the story with the view of depressing that stock.

Should the companies make any arrangement, it appears likely that Mr, D. H. Bates will be vested with the active control of the combined oppsition forces.

Middlesex Electric Light Company.

This company held its annual meeting at Portland, Me., on the 10th. The chair was occupied by Mr. Fifield and the board of directors for the ensuing year were chosen as follows: George W. Fifield, W. A. Ingham, E. P. Dennis, L. N. Downs, G. L. Huntoon, W. P. Burbank and C. R. Kimball. Clerk, Clarence Hale; assistant clerk, John H. McAlvin; treasurer, John H. McAlvin. The directors' report was read and placed on file. It gives a history of the company's development in Lowell, Mass. It shows that a 2 per cent. dividend has been declared, and the balance of earnings has been expended in improving the plant. In Lowell there are now 272 lights in operation, 84 being street lights. There are applications on file for 30 additional lights. The new Corliss engine which the company has recently put into the works on Middle street cost $1,900. The report expresses the confident belief that soon the company will be able to divide 6 per cent. on its capital stock. Following is the financial statement of the treasurer:

Statement, Sept. 1, 1883, to May 31, 1884:

DR.

Capital stock	$130,570.00
Mortgage account	15,000 00
Temporary loans	21,000.00
Bills payable	3,123.10
Profit and loss. Profit	5,258.08
Total	$174,951.18

CR.

Subsidy account	$50,000.00
Plant	91,744.57
Lighting stock on hand	678.04
Construction	5,412.41
Organization	2,108.00
Dividends	1,524.05
Real estate	20,349.18
Bills receivable	2,997.33
Cash on hand May 31, 1884	137.60
Total	$174,951.18

Standards of Illumination.

Some time ago Mr. W. H. Preece proposed a new standard of illumination for photometric purposes, based on the illumination of a surface, not the intensity of a standard light, such as the sperm candle or *bec carcel*. This standard, says *Engineering*, is the illumination of space lighted by one British standard candle at 2·7 in. distance, or what is the same thing, by a French standard "bec" at one metre distance. The plans in vogue of comparing two lights by their effect at different distances on two surfaces, is open to the objection that the absorbent state of the air is not taken into account, although the distances are different, and that the diverse colors of the lights are ignored. Rumford's shadow photometer and Bouguer's (Ritchie's and Bunsen's) method of comparing equally illuminated surfaces have hitherto been found the most practical. But for these plans a uniform standard of light is essential, and none such exists. Various countries have their own so-called standard, the French have the *carcel*, the Germans a standard candle, and so on, but these differ from each other and vary in themselves, and the new standard agreed on by the Electrical Congress is not yet in use. Mr. Preece employs a small Swan incandescent lamp, giving 2½ candle power with a current having an electromotive force of 5 volts. To illuminate the standard space he uses a contrivance consisting of a box in which the lamp is fixed. The box is blackened inside, and over the back part is stretched a diaphragm of drawing paper with a round grease spot in the centre, the size of a shilling, as in Bunsen's photometer. About 12 in. beyond the open end of the box, and behind the paper diaphragm, is another sheet or screen of drawing paper. No light falls on the diaphragm from without, except what comes from the screen which is illuminated by the light to be measured. This may be either directly received from a lamp or the diffused daylight of a room. The current in the incandescent lamp is then varied until its light, shining on the grease spot within the box, is equal to that reflected from the screen from without. In this case the two lights are equal when the spot seems to disappear according to the well-known principle of Bunsen's photometer. The current is supplied by a secondary battery and modified by a resistance rheostat in circuit. Experiments made by Mr. Preece showed that the illuminating power increases in the ratio of the sixth power of the current. The apparatus worked well, but Mr. Preece confesses that it depends on the constancy of the lamp employed; the glass becomes smoky by use, the fibre deteriorates, and the vacuum sometimes fails. These results are, however, slow, he states, and it is sufficient to compare either the light given by unit current with that of a standard candle or Harcourt flame. He believes that the light given by this source is more uniform and easily reproduced than any other.

Another Gong in Circuit.

To the Editor of The Electrical World:

SIR: The following may perhaps be "read with interest" by Messrs. Haskins, Lockwood, Tompkins, and others:

In 1867 I set up a combination local in the office of the Franklin Telegraph Co., Boston, on precisely the plan shown by Mr. Haskins in your issue of June 7. This worked all the sounders in the office, with capacity for many more. It was still in use on my last visit to that office in 1875, and Thomas Roche, then manager, assured me it would be kept up as long as he remained in charge. I remember that I felt particularly pleased at the success of this arrangement because all the "old hands" at telegraphy then declared that a combination could not be run successfully. My leading wires, or "mains," were of No. 8 copper, and the battery, which I had made for the purpose, was coupled in multiple arc, four series of two cells each.

It is obvious that the method is the corner stone of some of the recent systems of electrical sub-division and distribution. "Next!" J. C. UPHAM.

WORCESTER, Mass., June 12, 1884.

Overturned Philosophy.

To the Editor of The Electrical World:

SIR: As a matter of courtesy, I will gladly put Mr. Randall right on his queries regarding the invention of the telephone, although it appears to me that Mr. Randall, who has enriched the Patent-Office with so many telephone patents, ought not make himself guilty of the questions propounded. His difficulty is one which he has set up for himself, and consists in the innocent remark: "In that document M. Bourseul's invention is stated to *be*," etc., while as Mr. Randall himself corrects it afterward the document states to "*concern*" nothing more or less, etc.

It follows that the transmission of the spoken word was aimed at, but not that it was achieved.

Supposing Mr. Randall was fortunate enough to invent as a telectroscope, a simple apparatus for seeing electrically from a distance, would he consent to see Mr. Selencq being put up as prior inventor because this gentleman coined the name and applied it to the rude and unscientific combination of say a hundred conducting wires joined to so many selenium cells and optic points? Must I rehearse that M. Bourseul, with even his ingenuity, failed on the cardinal point by proposing a break of contact?

It is to be regretted that Mr. Bell did not adopt an entirely different name for the system embodying the continuous and speaking current. It would then have been easier to do justice in common writing to all parties concerned. E. BERLINER.

JUNE 17, 1884.

DEPARTMENT OF INQUIRIES.

While we are pleased to answer in this department all questions of general interest to our readers, and do so without charge for time or expense, we must request those of our patrons who desire information for their personal interest, and who cannot be properly answered in this way to send us with their request a small sum, say from $1 to $5, to pay for the time and the expense incurred for their exclusive benefit.

75—CONSTRUCTING A GALVANOMETER.

"I would like to ask if 15½ feet of No. 36 wire will do for the 10 ohms coil instead of 47 feet of No. 34 (see 'How to Construct a Galvanometer.") I have plenty of No. 36 wire and want to use it. The article says to place pins 5 feet a part, and by winding 36 wire 15½ times on the pins we get the right length for 50-ohms coil; 77½ feet is the length for 50 ohms. But by winding the wire 15½ times on the pins we get 155, the length for 100 ohms coil. Is there not a mistake in those figures?"

MT. VERNON, Mo. A. M. P.

Fifteen and one-half feet of No. 36 wire will answer for the 10-ohm coil, in the absence of 40 feet of No. 34 wire. It will not, however, fulfill the conditions required in paragraph 6, of the second part of my article, on "How to Construct a Galvanometer," for the reason that it will not occupy enough space around the needle; consequently the magnetic intensity will be less than it would be if No. 34 wire were used. *Any* size wire will answer, in an imperfect way, for any of the coils, but to obtain the best results from a given resistance of wire certain gauges and lengths should be used.

Regarding the method of measuring off the proper lengths of wire for the 50 and 100 ohms coils, by means of pins, I inadvertently said 15½ *windings* of No. 36 around pins placed 5 feet apart would give the required length for the 50-ohms coil. What I should have said was that the distance *between* the pins 15½ times would be the required length, not 15½ windings. The same error occurs in the case of the 100-ohms coil. Fifteen and a half times the distance between the pins 10 feet apart would be the proper length and not 15½ windings as printed. T. R. T.

AN OFFICE IN THE ROYAL EXCHANGE.—The Commercial Cable Co. have already opened an office in the London Royal Exchange.

AN IMPORTANT ENTERPRISE.—The Callender Insulating and Waterproofing Company, the well-known English manufacturers of electric-light, telegraph and telephone wire, have now placed themselves in a position to do a very large business in this country. Their offices and salesrooms are at 7 Nassau street, and their new factory, at East Newark, has just been completed and is now in operation. Their latest specialty is the manufacture of underground electric-light, telephone and telegraph wire. The various makes of the Callender Company have had larger sales than any other in Australia, and are extensively used all over England as well as in Belgium, Holland and France, where the company maintain branch offices. About two miles of the underground wire furnished by the company has been in use at Philadelphia by the Brush Electric Light Co. for some time, and there is already every indication of a large demand throughout the country for those productions of the concern which, though comparatively new here, are standard in their line abroad.

THE TELEGRAPH.

"CUT RATE" HANDBILLS.—The Chicago Board of Trade has been spreading handbills announcing another cut in rates to St. Louis and the Southwest.

JUST A CELL OR TWO.—At the Central Telegraph office, St. Martins-le Grand, London, there are no fewer than 12,000 Daniell, 8,000 Fuller's bichromate and 800 Leclanché cells in use.

MEXICAN ASSOCIATED PRESS.—A dispatch from the City of Mexico says that *La Patria*, the only journal which now receives telegrams from abroad, has invited other journals to join in forming an associated press. Four journals have thus far responded—the *Monitor Republicano*, *El Tiempo*, *La Voz de España*, and *El Nacional*.

EXCLUSIVE TELEGRAPH SERVICE.—The Gold & Stock Telegraph Company have sent out to down-town brokers and merchants an agreement which provides that all quotations and reports furnished are only for the exclusive use of subscribers and they shall not be delivered to others by messengers, telephone or otherwise. Several subscribers said they had refused to agree to it.—*Dial*

WISCONSIN EXTENSION.—Late advices from Wisconsin state that the Bankers & Merchants' Co. were rapidly pushing forward their lines toward St. Paul, Minn. A large gang of men have been at work between Chicago and Racine. A Milwaukee contractor has in hand the section between Milwaukee and Madison, the State capital, and has by this time finished it. The lines have all been put up in the best manner possible.

TELEGRAPH WIRES SEIZED.—The Superintendent of Police and Fire Alarm Telegraph, Philadelphia, Pa., took possession, on June 12, of the wires of the Postal Telegraph Company, strung upon the city's poles on account of the failure of the company to comply with the terms of the ordinance passed last February. This ordinance permitted the company to run two wires on the city poles upon condition that they should be placed under ground by May 1.

TESTIMONIALS TO THE B. & O.—The representatives at Chicago during the recent Republican Convention of the New York *Herald*, New York *Evening Telegram*, Baltimore *Sun* and other leading journals have, unsolicited, written to President Bates and Superintendent Zeublin, of the B. & O., some of the handsomest compliments we have ever seen, in regard to the service rendered during Convention week. One writer says: "I have been to every Convention since 1864, and I never saw so good a service. We court it right over again in July."

A SHORT CABLE FOR VACATION USE.—It has been suggested that the Western Union Company lay a cable from Gay Head, Mass., to Woods Holl, in which case it would lie parallel with the tide and would not be apt to be torn up by seaweed and other substances clinging to it, nor by vessels' anchors, as frequently happens now. This would necessitate the building of telegraph wires from Gay Head to Cottage City, but this extra expense, the Cottage City *Star* thinks, would be more than balanced by the fact that the cable would not have to be laid anew each year and the people could have the benefit of the cable the year round

THE TELEPHONE.

SEABRIGHT, N. J.—Manager Hudson, of Monmouth, N. J., intends opening a new telephone exchange at Seabright on the 25th inst. He has already secured 15 subscribers.

YOU CAN TALK THROUGH IT.—A new style of telephone has been invented by a Burlington man. It is said that its peculiarity consists in the fact that you can talk through it. This, however, is doubted.—*Monmouth, N. J., Republican.*

IN CHINA.—The telephone exchange at Shanghai has been transferred from the Oriental Telephone Company to the China and Japan Telephone Company, Lim., as well as the small exchange at Hong Kong, which had been closed temporarily for want of public support.

RACINE, WIS.—The Wisconsin Telephone Co. have secured a five years' lease of comfortable quarters in the new Blake Opera-House block, and have removed their exchange thereto. They now have 180 subscribers there and are constantly adding new ones. The exchange is managed by Mr. F. W. Phillips, formerly the company's special agent, with headquarters at Mineral Point. The switchboard in the new office is a fine one and will accommodate 250 lines. It was designed by Supt. A. S. Hibbard, and built under his supervision at the company's shops in Milwaukee.

THE OFFICIAL SYSTEM IN WASHINGTON.—The departmental underground telephone system at Washington which was described in these columns some time ago, has been so far completed as to permit of a thorough test of the practicability and efficiency of the system, which has proved in every way satisfactory. The circuit now includes the State, War and Navy departments, Col. Rockwell's office, the White House, Treasury department and Capitol. The Smithsonian Institution will be connected, and the number of telephones in the departments will be increased, and all the different bureaus will be eventually included in the system. This telephone line is intended for official use, and officials in different departments can communicate with each other without any danger of being interrupted or overheard. The operator in a department is supplied with a switchboard, which indicates the call of any one in that department. The operator is then informed through the telephone at his side what connection is wanted, and by a transfer of keys on the switchboard it is made and the caller and called can hold private conversation. The Waring cable is the one in use.

THE ELECTRIC LIGHT.

BIG RAPIDS, MICH., has organized a $10,000 electric light company.

RACINE, WIS.—S. S. Badger & Sons, of Chicago, Ill., have had a force of men at work putting in poles for the electric light at Racine. That city has a population of 20,000 and is therefore one of the largest without the electric light.

PUTTING DOWN GAS PIPES BY ELECTRIC LIGHT.—The Consumers' Gas Co. in Boston have applied for leave to lay pipes

through the streets and say that in crowded sections of the city work will be done by electric light at night.

THE Brooklyn Bridge trustees have purchased of the U. S. Company all the apparatus and plant that has been used on that structure. This is good evidence that they are satisfied.

LUCUS A NON LUCENDO.—The nineteen electric lights on Boston Common are to be removed for the unintelligible reason that they are so shut in by trees that reasonable benefit cannot be derived from them. There is a general feeling of regret in Boston at the loss of the lights on the Common.

THE IRONY OF FATE.—It is a little remarkable that the fire which destroyed the Swan electric light works at Lille, France, originated from the gas used for lighting the establishment. The fire is said to have broken out while the men were at breakfast. The managers of the works will probably use their own light hereafter.

A NEW CARBON POINT.—Zirconia, an extract from a mineral found in considerable quantities in the south, is quite likely to succeed petroleum coke for the manufacture of electric light carbons. Recent experiments have been highly successful, and the discoverer claims to be able to produce a carbon point two inches in length that will last for a year.—*New Orleans Times-Democrat.*

THE FULLER LIGHT AT MOBILE, ALA.—The Fuller Electric Light Company, of New York, will establish an electric plant here on their own account, provided fifty lights are guaranteed or subscribed for, upon the following terms: For lamps operated from dusk to twelve o'clock P. M., contracts during March, April, May, June, July and August, 55 cents per night. During September, October, November, December, January and February, 75 cents per night. For twelve months' contracts the price will be 75 cents per lamp per night for six months, commencing September 1, and 50 cents per night, commencing March 1. For three or more lamps on twelve months' contracts, from dusk to twelve o'clock P. M., a rebate of 5 per cent. will be allowed at expiration of contract. For lamps operated from dusk to daylight, 80 cents per night.

BRILLIANT BROOKLYN.—The ink was hardly dry on their final papers when Pope, Sewall & Co. dazzled the Brooklynites with Thomson-Houston lamps. They have already put up 50, and have contracts ahead for 150 more, and the light has evoked some very warm commendations for its steadiness and intensity. The station of the company is at 53 Liberty street, Brooklyn, close to the Bridge. There they have installed already a Porter-Allen engine of 100 H. P., one 10-light dynamo and two 25-lighters. The rest of the plant will be put in as quickly as possible. The firm deserve congratulations on their remarkable exhibition of energy and the clean, neat manner in which the work of running the wires and putting up the lights has been done.

MISCELLANEOUS NOTES.

RESISTANCE OF THE HUMAN BODY.—Mr. N. H. Stone says the electrical resistance of the human body, with a current of 3.6 volts, may be roughly given as from 1,200 to 1,500 ohms from foot to foot or from foot to hand.

STREET CAR MOTORS IN BRUSSELS.—The Rue de la Roi line of street cars in Brussels is to be equipped with electric motors, and separate accounts are to be kept. After a trial of one year, electricity will be exclusively employed on the street railways of Brussels if it meets all requirements.

STOCK QUOTATIONS.

Telegraph, telephone and electric light stocks were quoted as follows on Thursday at the Electric, Manufacturing and Miscellaneous Stock Exchange, and at the Stock Exchange:

TELEGRAPH.—Am. Cable, b 49½, a 50; American Rapid, b 40, a 50; B. & M. Co., a 30; Commercial Telegram Company Pref'd, a 109; Commercial Telegram Common, a 95; Harlem District Telegraph Co., b 2, a 2.50; Manhattan Telegraph, b 10, a 85; Mexican, b 125, a 147; Mutual Union, b 12, a14; W. U., 60¼ a 60½; Postal Telegraph (stock), b 5.13, a 5.75; Potsal Telegraph Bonds, 1st, 6 per cent., b 44.50, a 46.00.

The market has been somewhat steady and dull during the week. Against Western Union, the most has been made by bears of the probable further consolidation of opposition companies, and the outlay required by the underground wire bill.

Erastus Wiman is credited with the statement that the Bankers & Merchants' Co. have been working at a loss of $10,000 per week.

TELEPHONE.—American Bell, b 162, a 170; American Speaking, b 110, a 125; Currier Telephone Bell, b 3; Colombia and Panama, b 24.50, a 25; Continental, b 10; Dolbear, b 5, a 10; Erie, b 20, a 22; Hudson River, b 40, a 80; Inter-Continental, b .25, a 2.50; Mexican Central, a 3; Missouri & Kansas, a 10; Molecular, b 4, a 10; New England, b 20, a 23; New York, a 85; New York and New Jersey, b 20, a 60; New York and Pennsylvania, b 30, a 70; New York State Overland, b 7, a 17; People's, b 7, a 10.50; People's (N. E.), b 1, a 9; Solenoid, a 90; Southern Bell, b 95, a 125; Southern New England, a 175; Tropical, b 1, a 3; West India Telegraph and Telephone, b 1, a 1.25.

At the meeting of the directors of the American Bell Co., on the 12th, a semi-annual dividend of 3 per cent. was declared. This will leave a good surplus.

The Erie Co.'s quarterly dividend will be declared, it is said, 1 per cent.

The Boston *Advertiser* of June 19, thus quotes the local market: In telephone stocks American Bell advanced from 167 to 169, closing at 168½; New England advanced ⅜ to 21⅜; Erie declined ⅛ to 22½.

ELECTRIC LIGHT.—American, b 2, a 4; Baxter, b 22, a 25; Brush, b 50, a 80; Brush Illuminating, b 25, a 70; Daft, b 80; a 80; Edison, b 70, a 100; Edison Illuminating, b 30, a 75; Edison Isolated, a 90; Edison European, b 9, a 14; Excelsior, b 8; Swan Incandescent, b 12, a 40; United States, b 75, a 95; United States Illuminating Co., a 90.

Kohlsaat & Co., No. 30 Pine street, furnish the following quotations for miscellaneous securities:

	About.		About.
Edison Electric	100	Solenoid Electric	100
U. S. Electric Light	105	Commercial Tel. & T.	62

BUSINESS NOTICES.

A SECOND-HAND DYNAMO FOR SALE.—The Bernstein Co., Equitable Building, Boston, Mass., have a No. 3 Hochhausen dynamo, 40 volts E. M.F., .225 ohms internal resistance, for sale.

MEDICAL BATTERIES.—E. W. Wagner, of 36 John street, makes a specialty of pocket Gaiffe batteries. These are in three numbers and five sizes. The No. 3 has three cells, but still is so convenient that it will go into an ordinary pocket. Mr. Wagner has also met with much success in making electro-surgical appliances, and prides himself on turning out his work in a style that will compare on equal terms with the imported.

J. H. LONGSTREET & CO., of 9 Barclay street, manufacturer of telegraph, telephone and electric light supplies, has just completed a standard switch-board for the St. Louis office of the Postal Co., constructed on improved principles, with heavy brass connections, highly finished and assuring good service. The woodwork is of polished cherry. The board will work up to thirty lines. Mr. Longstreet is renovating and remodeling his salesrooms and offices.

A GOOD TREE TRIMMER.—Telegraph and telephone construction men know the great benefit of having a good tree trimmer, and now that electric lines are so much on the increase, appliances of that kind are more in demand than ever. The telegraph trimmer made by E. S. Lee & Co., of Rochester, N. Y., is a very neat and handy implement, and the cutter can be taken out for resharpening at any time. Its action is quick, and the mechanism is simplicity itself. A sample will be sent by mail for $1.50.

FARADISM IN DISEASE.—In discussing this subject the *California Medical Journal* says: "A little tact will enable any person who understands the principles involved to operate almost any good faradic machine effectually. We would not advise any one, however, to invest in a frictional battery. Saying nothing of the need of an assistant to turn the crank, the current is so unsteady, harsh and unpleasant as to render the kind objectionable. One in which the induced current is generated by galvanism is far preferable. As there is nothing gained in investing in cheap Johns, we would advise the purchase in the start of a good Dr. Jerome Kidder apparatus, manufactured at 820 Broadway, New York City. We regard this make as preferable to all others."

THE CUMMER ENGINE CO. shipped another one of their Ballantine ice and refrigerating machines recently to the Robert Portner Brewing Co., Alexandria, Va., and will shortly ship two more of these machines to the Buffalo Co-operative Brewing Co., Buffalo, N. Y. The refrigerating machine recently shipped by the Cummer Co. to Albert Ziegele & Co., of Buffalo, has been started up with great success, and the purchasers are much pleased with its performance. The Cummer Engine Co. have just furnished a 225 H. P. engine to the Amoskeag Mfg. Co., of Manchester, N. H., and will in a few days ship a 67 H. P. engine to Messrs. Stults & Kill, of Orwell, O. The following orders have just been placed with the Cummer Engine Co., a 55 H. P. engine with complete outfit for Messrs. Todd & Hosford, Eugene, Ind.; one of 350 H. P. for Carlton, Foster & Co., Oshkosh, Wis., and a 55 H. P. outfit for A. Dietly & Son, Moorheadville, Pa.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED JUNE 3, 1884.

Electric Lamp; Alexander Welsh, of St. Denis, Md., Assignor to the Viaduct Manufacturing Co., of Baltimore City..... 299,708

There are three or more carbon filaments in the globe, all connected in parallel, and so arranged as to cause the light to resemble in shape an ordinary gas-light.

Electro-Magnetic Indicator; W. S. Johnson, Whitewater; Assignor of one-half to William Blankinton, Milwaukee, Wis..... 299,552

A metallic thermometer in expanding or contracting makes two or more contacts which bring into circuit successively electro-magnets which cause the movement of the dial-pointer.

Electric Alarm Applied to Cots, etc.; William F. Keep and Walter H. Keep, of County of Middlesex, England..... 299,694

Applied to children's cots. A light netting or frame is put on the upper part of the cot or bedstead. When the child attempts to get out the springing of the net closes an electric circuit to an alarm bell.

Electric Lamp; Alexander Welsh, of St. Denis, Md., Assignor to the Viaduct Manufacturing Co., of Baltimore City..... 299,885

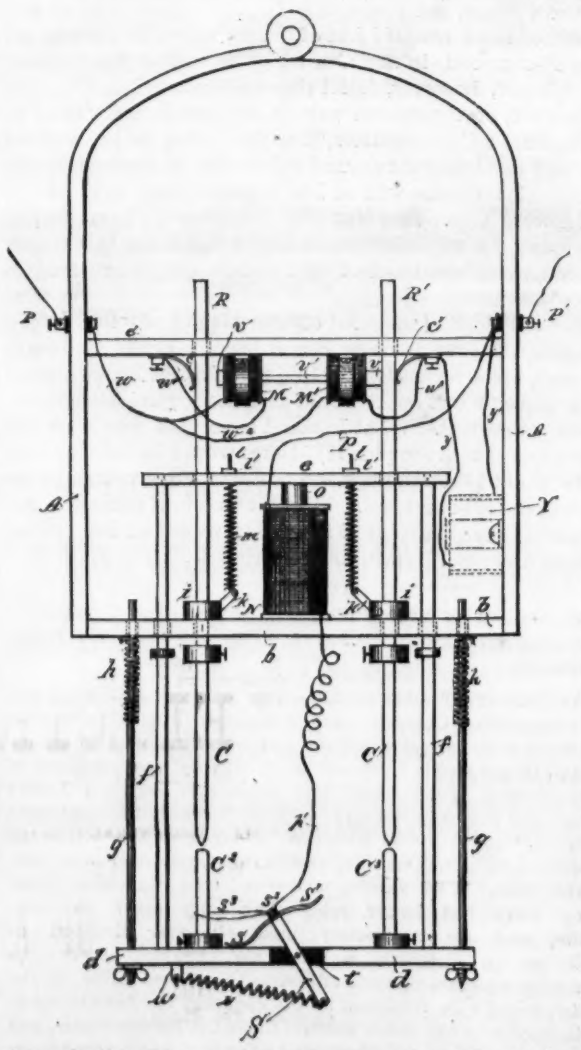
The connecting wires are passed through and sealed in a mirror lying horizontally in the globe, or the base of the globe is made as a mirror. The filament is curved to approximately the shape of the face of the mirror.

Electric Fire Alarm; Geo. E. Hovenden and Edwin R. Hovenden, of Grand Rapids, Mich..... 299,546

Consists, first, of a series of electric bells in an electric circuit, which includes also a clock, a hand of which closes the circuit at determined moments of time, in combination with mechanism for closing the circuit to any given bell or bells. In connection with this combination is mechanism adapted to close the circuit to all rooms at once, and thus sound all the alarms at once, at the will of the operator.

Electric Arc Lamp; Thomas G. Turner, of New York, N. Y., Assignor by mesne assignments, to H. A. Seymour, of Washington, D. C..... 299,600

When the carbons C and C^2 have been so far consumed that the arc reaches the fine wire loop s^3, said loop will be fused and release the switch lever S and said lever will then, by the action of the spring u, be thrown over so that its spring s' will strike the bar d near the foot of the carbon C^3. The carbon C and C^2 will be thus cut out of circuit and the carbon C' and C^3 thrown into circuit as follows: The current will now pass from the wire w over the branch wire w^2, helix M', wire w^3 and the spring c', which bears against the rod R', being thus communicated to said rod and passing over it and the carbons C' and C^3 and thence over the spring s' to the switch lever and off to the line, as before. It will now be understood that the helix M', being in circuit, draws in its core v to release the rod R' and to project the core of helix M to lock the rod R. The feeding of the second pair of carbons will at the proper times be performed the same as described for the first pair.



Magneto-Electric Machine; Henry Francis Joel, of London, England..... 299,551

Pacinnoti armature core; built up of plates bolted to the arms of a spider, and peculiarly shaped field magnets.

Metallic Circuit for Telephone Exchanges; James C. Warner and Ernest P. Warner, of Chicago, Ill., Assignor to the Western Electric Co., of same place..... 299,603

Facilitates the method of connecting subscribers and reduces the amount of apparatus heretofore requisite.

Method of and Apparatus for Individualizing Telephone Time Signals; Henry B. Lytle and John J. Carty, of Boston, Mass..... 299,561

Regulates or individualizes the supply of time signals to telephone subscribers by producing induced currents corresponding to the time signals in the line circuits to be supplied.

Printing Telegraph; Wm. J. McCausland, of Philadelphia, Pa., Assignor to William W. Kurtz, of same place..... 299,664

Consists of various details calculated to enable the working of a printing telegraph with greater rapidity and accuracy than heretofore.

Telephone Time-Signal Apparatus; Henry B. Lytle and John J. Carty, of Boston, Mass..... 299,562

Transmits to telephone subscribers an audible signal for each hour and minute.

Telephone System; Chas. H. Haskins, Milwaukee, Wis., Assignor to the Western Electric Co., of Chicago, Ill..... 299,926

Consists in the combination with a telephonic-exchange signal system of a pole-changer by which the signal is operated continuously, when once actuated, until the connection with the pole-changer is broken.